

## UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The sum of 1600*l.* has been recently contributed to the University Benefaction Fund for the endowment of a lectureship in special pathology. The collection of this fund is largely due to the activity of Prof. G. Sims Woodhead, and the lectureship will be known as the Huddersfield lectureship, in recognition of the town which has largely supplied the capital sum. The general board will proceed shortly to elect the lecturer. Applications should be sent in to the Vice-Chancellor, on or before Tuesday, March 7.

The general board has approved Mr. J. J. H. Teall, of St. John's College, Director of the Geological Survey, for the degree of Sc.D.

The Smith's prizes have been awarded to Mr. H. Bate-man for his essay on "The solution of linear differential equations by means of definite integrals," and to Mr. P. E. Marrack for his essay on "Absorption by matter of Röntgen and  $\gamma$  rays." Both the students belong to Trinity College.

Mr. F. J. M. Stratton, of Caius College, has been elected to an Isaac Newton studentship.

LONDON.—At the South-Western Polytechnic Miss Gladys Martyn has been elected to the free studentship in the physical training department. She will devote part of her time to the scientific study of anthropometric measurements and eugenics. Mr. L. D. Coueslant, lecturer in the engineering department of the polytechnic, has been elected to be head of the mechanical and civil engineering department of the Technical Institute of Sunderland. Mr. A. J. Makower has been elected head of the electrical engineering department in succession to Mr. C. F. Smith.

The Fishmongers' Company has granted a sum of 100*l.* toward the funds necessary for the incorporation of University College in the University of London. By this grant the amount still required to complete the funds necessary for incorporation is reduced to 17,000*l.*, a total of 183,000*l.* having now been raised for the purpose. Dr. A. R. Cushny, of the University of Michigan, U.S.A., has been appointed to the chair of pharmacology and materia medica in the college. Prof. L. F. Vernon-Harcourt has resigned the chair of civil engineering and surveying.

We learn from *Science* that Mrs. Goldwin Smith has given 4000*l.* to Cornell University; and that by the will of the late Mr. E. A. Goodnough, of Worcester, gifts are made as follows:—5000*l.* to Mount Holyoke College, 3000*l.* to Iowa College, 5000*l.* to the Huguenot Seminary in South Africa, 1000*l.* to Washburn College in Kansas, 2000*l.* to Drury College in Missouri.

THE *Engineering and Mining Journal* of New York publishes the views of Prof. H. M. Howe, the eminent American metallurgist, on the vexed question whether technical schools serve the interests of the community better if they are parts of great universities or if they are isolated institutions. Wisely guided association, while it need not deprive the technical school of character and individuality, should, he thinks, benefit the community through the broadening interaction of the teachers of pure science and the technical teachers, with their closer contact with active life. The grand scale should effect great economy, not so much in saving salaries and in widening the use of the more expensive instruments, as in fitting work to worker, and in supplying more fully the eminent with work on their own plane.

IN a paper on "Architectural Education" read before a meeting of the Royal Institute of British Architects on Monday, Mr. R. Blomfield described the report and syllabus prepared by the Board of Architectural Education appointed by the institute. The following is the syllabus proposed by the board:—(1) Building materials; (2) construction, including (a) applied mechanics, strictly in practical relation to construction, and (b) the practical methods of the building trades; (3) architectural drawing, including working and freehand drawings, solid geometry, and measured drawings of historical examples of architecture; (4) geometrical projection and rudimentary perspective, this latter to be studied as an aid to the shaping and modelling of buildings, not as a means of elaborating architectural

drawings; (5) design and the history of architecture as supplemental to and elucidatory of the study of construction. It is pointed out that these subjects should be taught by class work in the schools and by demonstration in the laboratory or lecture theatre of practical work. The laboratory or workshop for training in practical work is an essential feature of the scheme. The demonstrations given in the laboratory should be in intimate relations with the lectures given in the class-rooms of the schools, and the course must be arranged so that the training in the class-rooms and in the workshops proceed together. In moving a vote of thanks to Mr. Blomfield, Sir Arthur Rücker said that, if the great movement which is taking place in technical education is to have a sound foundation, it is absolutely necessary that it should be carried out by those who are themselves the professional members of the great professions and trades which they wish to carry to a point of higher education.

## SOCIETIES AND ACADEMIES.

## LONDON.

**Royal Society, January 26.**—"On the Drift produced in Ions by Electromagnetic Disturbances, and a Theory of Radio-activity." By George W. Walker. Communicated by Prof. A. Gray, F.R.S.

Electromagnetic waves produce certain mechanical forces on an electrically charged particle, and the equations of motion of such a particle can be formed. When the particle is regarded as exceedingly small and endowed with a charge  $e$  and inertia  $m$ , which includes electrical inertia, the equations take a comparatively simple form. When the small viscous term due to radiation from the particle is neglected the equations can be integrated in certain cases, and it is found that the continued propagation of waves involves an alteration of the position of the particle in space.

The case which suggested the general result was that in which the waves form an infinite simple harmonic train, and the solution showed that while the passage of a complete wave restored the initial velocities of the particle, its position in space was altered.

This alteration of position is not completely accounted for by the change due to the initial velocities had there been no waves. In particular, if the particle is initially at rest, the passage of a complete wave restores the state of rest, but the particle now occupies a new position in space. This curious result has an analogue in the case of a simple pendulum making complete revolutions, where the elapse of a complete period restores the velocity while the angle described has increased by  $2\pi$ .

The continued propagation of the waves thus involves the result that the particle appears to drift through space in a manner which can be completely determined when the initial circumstances are given and the constants of the train of waves are known.

Similar results are found to hold for any kind of plane disturbances propagated in a straight line. Several cases are worked out where the disturbance is of a simple character. The disturbance is that in which the electric force is  $X_0$ , with the appropriate magnetic force  $X_0/V$  at right angles to  $X_0$ , for a time  $d/V$  succeeded by zero force for a time  $d/V$ , and this again succeeded by electric force  $-X_0$  for a time  $d/V$ , and zero force for a time  $d/V$ , after which the disturbance recurs. In one case where the particle is initially at rest it appears to drift with the waves, while in another case where the particle has a certain initial velocity at right angles to the direction of propagation it drifts against the waves. If radiation from the particle is neglected, the passage of a complete pulse in which the integrated effect of electric force is zero involves a restoration of the original energy of the particle, and thus the transference of the particle is accomplished without abstraction of energy from the pulse. The expressions for the apparent velocity of drifting in the direction of propagation of the waves are found to depend on the squares of the charge, so that it is probable that an electrically neutral system will also be made to drift.

It is pointed out that if the equations held up to velocities of the charged particle equal to that of radiation, a particle

originally moving in the direction of propagation with a velocity slightly less than that of radiation may be picked up by the waves and carried forward with the velocity of radiation.

The conclusion is that the propagation of disturbances of any form in a straight line involves a sorting of free ions and molecules according to their initial circumstances, and streaming of these both with and against the waves must take place.

These results are general, and are limited only by the limits of the electrodynamic equations. They suggest, however, a possible explanation of the action of all kinds of ionising agents.

In particular, it is suggested that if a radio-active substance is an origin from which electromagnetic disturbances are radiated, these disturbances probably ionise the gas in the immediate vicinity and produce streaming of ions and molecules with their associated properties both outwards from and inwards to the substance. This view does not necessarily involve the supposition that there is a continual diminution of the substance.

The results may also throw some light on the question of the energy sent out. For, suppose that there exist a positive and a negative ion which, in the absence of the pulses, would recombine at some point A, thereby radiating a certain amount of energy, then the directive action of the pulses may make them recombine at some other point B. Thus the radiated energy will proceed from the point B instead of from the point A. The transference of a single free ion can be accomplished without the expenditure of energy, and it is possible that the transference of the positive and negative ions may take place without any abstraction of energy from the pulses. Since, however, in general the transference may involve a relative displacement of the two ions, abstraction of energy from the pulses may be involved, so that the question is one about which the greatest caution must be exercised. It cannot be decided without further investigation.

These considerations are in general agreement with the views that have been expressed by Lord Kelvin and Prof. and Madame Curie.

The question whether the apparent velocity of drifting may be of the order indicated by experiment is considered; and it is shown that in order to give velocities comparable with that of radiation, the theory leads us to expect that the frequency of vibration of the waves radiated by the particles should be of the order for visible or ultra-violet light.

The differences between ionising agents would turn to a considerable extent on the character of the disturbances radiated.

Since the propagation of waves through a region of space containing matter involves streaming of the matter, the continued propagation cannot be quite independent of any statical, electric or magnetic field present.

February 2.—“Note on the Determination of the Volume Elasticity of Elastic Solids.” By Dr. C. Chree, F.R.S.

PARIS.

**Academy of Sciences, February 13.**—M. Troost in the chair.—On the existence of an ellipsoid of absorption in all translucent crystals, even when without a plane of symmetry or a principal axis: J. Boussinesq.—Study of the silicide of carbon from the Cañon Diablo meteorite: Henri Moissan. In the residue left after dissolving a block of this meteorite weighing 53 kilograms in hydrochloric acid, a hexagonal crystal of silicon carbide was noticed. It was completely identified by its appearance, density (3.2), and indifference to most chemical reagents. Fused caustic potash gave potassium silicate, and fused lead chromate, carbon dioxide. The origin of this block of iron may be terrestrial or sidereal, but the existence of silicon carbide in the midst of the metal shows that the products prepared with the electric furnace are met with in nature.—On some constants of pure methane, and on the action of solid methane on liquid fluorine: H. Moissan and Chavanne (see p. 400).—The eruptive basic rocks of French Guinea: A. Lacroix. Besides biotite granite, numerous basic eruptive rocks have been found in French Guinea, especially gabbros, peridotites, and diabases, a detailed account of which is given. Attention is directed to the difference in the mode of weathering in tropical and in temperate climates, as exemplified in these samples.—On the use of photography as an aid to

topography: A. Laussedat. An account of an application of the photographic method to the survey of the region round Mount Argée, in Cappadocia, on a scale of 1/80,000. The use of photography has the advantage of reducing very considerably the time required as compared with the ordinary methods of surveying, and is especially advantageous in mountainous regions.—Observations of the Borrelly comet (1904 e) made with the Brunner equatorial at the Observatory of Lyons: J. Guillaume. The apparent position of the comet was measured on January 3, together with the positions of two comparison stars. The comet appeared as an object of the tenth magnitude, and possessed a small nucleus.—Observations of the sun made at the Observatory of Lyons with the 16-centimetre Brunner equatorial during the fourth quarter of 1904: J. Guillaume. The results are summarised in three tables giving the number of spots, their distribution in latitude, and the distribution of the faculæ in latitude.—Actinometric observations made at the summit of Mont Blanc: A. Hansky. The observations were made in the observatory at the summit of Mont Blanc with the instruments of M. Crova. The conditions in 1900 were more favourable than in 1897 and 1898, and the results for this year are given in detail, the most probable result for the constant being between 3.0 and 3.5.—On linear partial differential equations: M. Hadamard.—On the deviation of falling bodies: Maurice Fouché. A reply to a criticism of M. de Sparre on a former paper by the author.—The thickness of transparent sheets of iron: L. Houllevigue. After trying unsuccessfully various methods for estimating the thickness of thin films of iron, a colorimetric estimation with sulphocyanide was found to give trustworthy results. The transparency (T) of these films was determined before dissolving in acid for the colorimetric test, and for films varying in thickness from 0.024 to 0.056 milligram per square centimetre the thickness was found to be a linear function of log T. This curve being established, the thickness of any given film could be quickly determined by the photometer.—The automatic registration of atmospheric ionisation: Charles Nordmann. The charge introduced by the ions is removed from the condenser plate by falling drops of water, the constancy of flow being secured by a Mariotte's bottle. The deviations of the electrometer in the arrangement described, a diagram of which is given, are proportional to the number of ions per unit volume of the gas.—On the heat given off by paraffin submitted to the action of a rotating electrostatic field of high frequency: Ch. Eug. Guye and P. Denso.—On a new reaction of aldehydes and the isomerism of their oxides: A. Conduché. The aldehyde is added to a dilute aqueous solution containing equimolecular proportions of hydroxylamine hydrochloride and potassium cyanate. Well crystallised compounds separate out, the melting points of which characterise the aldehyde. The discussion of the composition of these compounds throws light on the constitution of the isomeric aldoloximes. No corresponding compounds are obtained when a ketone is substituted for the aldehyde in the reaction.—The action of hydrocyanic acid on ethiophylline: M. Lespieau. The nitrile  $C_2H_5 \cdot O \cdot CH_2 \cdot CH(OH) \cdot CH_2 \cdot CN$  is obtained in this reaction, and the preparation and properties of several substances derived from this are described.—On the non-existence of two stereoisomeric ethyl dioximidobutyrate: L. Bouveault and A. Wahl. The supposed existence of two stereoisomers indicated by Hantzsch and by Nussberger is shown to be erroneous.—On the transformation of amylocellulose into starch: Eugène Roux.—On the electrolysis of organic acids by means of the alternating current: André Brochet and Joseph Petit. The electrolysis of formic and oxalic acids can be easily effected with the alternating current; the results are the same as with the direct current, but the yields are much higher.—On the phosphorescence of phosphorus: E. Jungfleisch. It is shown that an inert gas, saturated with the vapour of phosphorus, contains an extremely small weight of phosphorus, the oxidation of which gives rise to scarcely appreciable light effects. The author regards his experiments as proving that a lower volatile oxide is first produced, and that it is the oxidation of this which gives rise to the luminous phenomena.—On isodimorphism: Frédéric Wallerant.—On the extension of the alkaline rocks in the basin of Aouache: H. Arsan-daux.—Two species of Dalbergia in Madagascar produc-



ing a variety of ebony wood: Henri **Jumelle**.—On the biology of the Saprolegnia: Paul **Dop**.—The utilisation of the essential oils in the etiolated plant: Eug. **Charabot** and Alex. **Hébert**. It is shown that in the absence of light the plant is capable of consuming the essential oil which it contains, especially the terpenic compounds.—The relations between *Bougainvillia fruticosa* and *Bougainvillia ramosa*: Paul **Hallex**. The author regards these as one and the same species, the one belonging to calm water, the other to rough water, the slight difference between the two being due to this difference in the surroundings.—Experimental researches on the relations between arterial pressure and the amounts of chloroform absorbed: J. **Tissot**. In the case of subjects under chloroform the examination of the arterial pressure gives indications of approaching trouble earlier than the respiratory modifications, the latter only appearing when the dangerous condition is already set up.—A comparative study of the auto-conducting cage and the condensing couch in the treatment of arterial hypertension by d'Arsonvalisation: A. **Moutier** and A. **Challamel**. The results obtained with the solenoid are better than with the couch, the commonly accepted view that the two are equivalent being erroneous.—The action of radium on the torpedo fish: Maurice **Mendelssohn**.—On the tectonic of the region north of the Montagne Noire: Jules **Bergeron**.—The daily variation of temperature in the upper regions of the atmosphere: L. Teisserenc de **Bort**.

## DIARY OF SOCIETIES.

### THURSDAY, FEBRUARY 23.

ROYAL SOCIETY, at 4.30.—On some New Species of Lagenostoma; a Type of Pteridosporeous Seed from the Coal-measures: E. A. Newell **Arber**.—On a New Rhabdosphere: G. Murray, F.R.S.—Two Cases of Trichromatic Vision: Dr. F. W. Edridge-Green.—On Changes observable in the Liver Cells during Digestion, and their Relation to Hepatic Secretion: Prof. E. Wace **Carlier**.—The Colour-Physiology of the Higher Crustacea. Part III.: F. Keeble and Dr. F. W. Gamble.—Phosphorescence caused by the Beta and Gamma Rays of Radium. Part II.—G. T. **Beilby**.  
ROYAL INSTITUTION, at 5.—Recent Work of the Geological Survey: Prof. J. J. H. **Teall**, F.R.S.  
INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Continuation of Discussion:—The Value of Overhead Mains for Electric Distribution in the United Kingdom: G. L. **Addenbrooke**.

### FRIDAY, FEBRUARY 24

ROYAL INSTITUTION, at 9.—Fungi: Prof. H. Marshall **Ward**, F.R.S.  
PHYSICAL SOCIETY, at 5.—On the Curvature Method of teaching Geometrical Optics: Dr. C. V. **Drysdale**.—Exhibition of Dr. Meisling's Colour Patch Apparatus: R. J. **Sower**.—A Method of illustrating the Laws of the Simple Pendulum, and an Exhibition of String Models of Optical Systems: J. **Schofield**.  
INSTITUTION OF CIVIL ENGINEERS, at 8.—Morecambe Sewerage: Method of laying a 15-inch Cast-iron Sewer under the London and North-Western Railway: F. D. **Flint**.—The Reconstruction of Bow Bridge over the River **Lea**: H. M. **Rootham**.

### SATURDAY, FEBRUARY 25.

ROYAL INSTITUTION, at 3.—Archæology: D. G. **Hogarth**.  
THE ESSEX FIELD CLUB, at 6.30 (at the Essex Museum of Natural History, Stratford).—Straw Plait; a Lost Essex Industry, I.: Chalkley **Gould**.—Family and Life of **Gilbert**, of Colchester: Prof. **Silvanus P. Thompson**, F.R.S.—Revised List of the Hymenomycetal Fungi of Essex: Dr. M. C. **Cooke** and **George Massee**.

### MONDAY, FEBRUARY 27.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—The Scientific Results of the National Antarctic Expedition: Capt. R. F. **Scott**, C.V.O., R.N.  
SOCIETY OF ARTS, at 8.—Internal Combustion Engines: **Dugald Clerk**.  
INSTITUTE OF ACTUARIES, at 5.—Changes in Pure Premium Policy.—Values consequent upon Variations in the Rate of Interest or the Rate of Mortality, or upon the Introduction of the Rate of Discontinuance: G. J. **Lidstone**.

### TUESDAY, FEBRUARY 28.

ROYAL INSTITUTION, at 5.—Some Recent Biometric Studies: Prof. K. **Pearson**, F.R.S.  
SOCIETY OF ARTS, at 4.30.—The Manufactures of Greater Britain. I. Canada: C. F. **Just**.  
INSTITUTION OF CIVIL ENGINEERS, at 8.—Surface-Condensing Plants, and the Value of the Vacuum produced: R. W. **Allen**.

### WEDNESDAY, MARCH 1.

SOCIETY OF PUBLIC ANALYSTS, at 8.—The Estimation of Oxygen in Copper: S. **Dickson**.—(1) Some Conditions affecting the Ether Value of Brandy; (2) The Determination of Higher Alcohols in Spirits. I.: Dr. Philip **Schidrowitz** and F. **Kaye**.  
ENTOMOLOGICAL SOCIETY, at 8.—New Species of Diurnal Lepidoptera from Northern Rhodesia: **Herbert Druce** and **Hamilton H. Druce**.—On Three Remarkable New Genera of Microlepidoptera: Sir **George F. Hampson**, Bart.  
CRITICAL SOCIETY OF UNIVERSITY COLLEGE (Gower Street, W.C.), at 5.—Evolution and Speculation: Sir **Frederick Pollock**, Bart. Visitors invited.

### THURSDAY, MARCH 2.

ROYAL SOCIETY, at 4.30.—Probable Papers: Further Researches on the Temperature Classification of Stars. No. 2: Sir **Norman Lockyer**, K.C.B., F.R.S.—On the Radio-active Minerals: Hon. R. J. **Strutt**.—Atmospheric Electricity in High Latitudes: G. C. **Simpson**.—On the Spectrum of Silicon, with a Note on the Spectrum of Fluorine: J. **Lunt**.—On the Electric Resistance to the Motion of a Charged Sphere in Free Space or in a Field of Force: G. W. **Walker**.  
CHEMICAL SOCIETY, at 8.—The Latent Heat of Evaporation of Benzene and some other Compounds: J. **Campbell Brown**.—The Relation between Natural and Synthetic Glycerolphosphoric Acids: F. B. **Power** and F. **Tutin**.—The Reduction of Isophthalic Acid: W. H. **Perkin**, jun., and S. S. **Pickles**.—The Transmutation of Geometrical Isomers: A. W. **Stewart**.  
ROYAL INSTITUTION, at 5.—Recent Astronomical Progress: Prof. H. H. **Turner**, F.R.S.  
RÖNTGEN SOCIETY, at 8.15.—A discussion on "The Necessity of Accurate Measurement in X-ray and High Frequency Work," opened by Dr. W. D. **Butcher**.  
CIVIL AND MECHANICAL ENGINEERS' SOCIETY, at 8.—Engineering Expert Evidence: J. F. **Reade**.  
LINNEAN SOCIETY, at 8.—Zoological Nomenclature; International Rules and Others (to be followed by a discussion): Rev. T. R. R. **Stebbing**, F.R.S.—Biscayan Plankton. Part IV. The Thaliacea: Dr. G. **Herbert Fowler**.  
INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Type-setting by Telegraph: D. **Murray**.

### FRIDAY, MARCH 3.

ROYAL INSTITUTION, at 9.—Recent Advances in Wireless Telegraphy: Chev. G. **Marconi**.

### SATURDAY, MARCH 4.

ROYAL INSTITUTION, at 3.—Archæology: D. G. **Hogarth**.

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